Title: Olympic Circles

Brief Overview:

Students will apply their knowledge of circular geometry (circles, radius, diameter, arcs, chords), measurement, and use of a safety compass to design an Olympic Game emblem. The students will then write to persuade. The students will work in pairs to complete these instructional activities with the exception of the individual emblem and writing activity. This unit will integrate mathematics with the Olympics.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*

- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*

- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*

- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*

- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*

- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

  Geometry
  - *Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.*
  - *Specify locations and describe spatial relationships using coordinate geometry and other representational systems.*
  - *Apply transformations and use symmetry to analyze mathematical situations.*
  - *Use visualization, spatial reasoning, and geometric modeling to solve problems.*

  Measurement
  - *Understand measurable attributes of objects and the units, systems, and processes of measurement.*
  - *Apply appropriate techniques, tools, and formulas to determine measurements.*

  Data Analysis and Probability
  - *Develop and evaluate inferences and predictions that are based on data.*

- **Process Standards**

Problem Solving
- *Build new mathematical knowledge through problem solving.*
- *Solve problems that arise in mathematics and in other contexts.*
- *Monitor and reflect on the process of mathematical problem solving.*

Reasoning and Proof
- *Make and investigate mathematical conjectures.*

Communication
- *Organize and consolidate their mathematical thinking through communication.*
- *Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.*
- *Analyze and evaluate the mathematical thinking and strategies of others.*
- *Use the language of mathematics to express mathematical ideas precisely.*

Connections
- *Recognize and use connections among mathematical ideas.*
- *Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.*
- *Recognize and apply mathematics in contexts outside of mathematics.*

Representation
- *Create and use representations to organize, record, and communicate mathematical ideas.*
- *Select, apply, and translate among mathematical representations to solve problems.*
- *Use representations to model and interpret physical, social, and mathematical phenomena.*

Grade/Level:

Grades 3 - 5

Duration/Length:

Approximately four to five class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Use of a ruler to measure inches
- Elements of persuasive writing
- Geometrical concepts of lines and angles
- Working in pairs

Student Outcomes:

Students will:

- construct a circle with a specific radius.
- use a safety compass.

- create an Olympic emblem.
- write a persuasive letter with business letter format.
- develop and use circular geometric vocabulary such as, radius, diameter, circumference, circumference, arc, and chord.

Materials/Resources/Printed Materials:

- Bulletin board paper
- Pencils
- Paper
- Rulers
- Scissors
- SAFE-T compasses
- Chalkboard demonstration SAFE-T compass
- Crayons

Development/Procedures:

Day 1: Properties of Circles

- Warm-up: Give students a circle of yellow paper. Ask the students to write one thing that they know about circles on the paper. Allow about 5 minutes and then have the students present and place their circles under the K of a KWL Chart (Teacher Resource #1)   Repetitions will be placed on top of each other.

- Have students find circles in the classroom and discuss how the circles are alike and how they are different.

- Distribute the Olympic Rings Symbol (Student Resource # 1).

- Explain that the Olympic Rings Symbol was created by Baron Pierre de Coubertin in 1913. The five rings symbolize the five continents represented in the Modern Olympic Games: Europe, Asia, Oceania, North America and South America. Every country's flag in those continents has at least one of the ring colors. The ring colors from left to right are blue, yellow, black, green, and red.

- Have students color the rings with the correct colors.

- Add geometric vocabulary to the mathematics word wall. Include terms such as circle, lines, polygons, angle, center, curve, etc.

- Discuss possible ways to construct a circle. What do you need to make a circle?

- Have students experiment in pairs with SAFE-T compasses, taking turns to draw circles of different sizes on paper.

- Have the pairs of students write a sentence on a sentence strip about circles and share their responses with the class.

- Homework: Distribute a circle of blue paper and have them write one thing they would like to learn about circles on the circle for homework.

Day 2: Investigating Circles

• Have students share their homework and place their circles under the W of the KWL Chart.

• Review students' understanding of circles by using a Venn Diagram (<u>Teacher Resource #2</u>) transparency. As a class identify the similarities and differences of polygons and circles.

• Have students discuss how they draw polygons and circles.

• List on chart the materials needed to draw circles:
    a compass
    a writing instrument
    a writing surface

• Introduce the SAFE-T Compass by using the large chalkboard instructional model.

• Demonstrate how the two parts of a compass move.

• Draw several different size circles on the board.

• Brainstorm how the circles are alike and different.

• Record on a chart the vocabulary naming the parts of circles:
    inside
    outside
    center
    arc

• Demonstrate the directions for drawing a circle.
    Directions for drawing a large circle:
     - Press down on the center of the dial with a pencil.
     - Rotate the arm of the compass in one direction to hit an arc to form a circle.
    Directions for drawing a small circle:
     - Press down on the arm of the compass.
     - Rotate the dial in one direction to make a circle.

• Have the students repeat the directions in their own words.

• Have the students work in pairs drawing circles of different sizes using their SAFE-T Compasses.

• <u>Homework</u>: Draw three different size circles.

Day 3: Circle Drawings

• Have students share homework circles.

• Have the students show the center point of one of their circles and label the point A.

• Have the students cut out this circle and fold it exactly in half.

• Have the students open their circles and discuss the fold line.

- Establish that a line that goes through the center from one side of the circle to the other is named the diameter.

- Instruct the students to draw a line from the center of their circle to the side of the circle. Inform them that they have drawn a radius of their circle.

- Ask how the diameter and radius compare. (The radius is one half of the diameter of the circle.)

- Check measurement with a ruler.

- In pairs, have students construct circles with their compasses and label the center point of the circle with a letter.

- Using their rulers, have students label at least 2 diameters of one circle and 6 radii of another circle. Measure each diameter with a ruler. The diameters should all be the same length. Measure the each radius with a ruler. All the radii should be the same length.

- On another paper, have students draw some more circles with a specific radius such as 2 inches, 3 inches, and 4 inches. Have them predict the diameter of these circles before they measure them. (2-inch radius = 4 inches in diameter; 3-inch radius = 6 inches in diameter, etc.)

- Have the students draw a vertical and a horizontal diameter on one circle. Then have the students connect the ends of the radii. The lines drawn are chords. (A chord is a line segment joining two points of a circle. It doesn't pass through the center.)

- Add diameter, radius and chord to the math wall of vocabulary.

- <u>Homework</u> - Draw a circle with a 5 inch radius on large paper and label the center point, a diameter, a radius and a chord of their circle.

Day 4: Designs with Circles

Part A - Students will create a geometric design using chords, diameters, arcs, and circles. (Activity from Creative Constructions by Dale Seymour and Reuben Schadler adapted by Bette Kundert, 1999.)

- Use a compass to draw a circle with a 3-inch radius.

- Make a small arc at the top of the circle that intersects with the circle.

- Using the compass, measure a three-inch distance from the point where the arc intersects the circle. Make an arc with the compass that creates a second point of intersection with the circle.

- Move the compass to the new arc and repeat this process until you have six arcs that create six points of intersection equidistant around your circle.

- Connect side-by-side points of intersection with a straight line.

- Connect every other point with a straight line.

- Connect opposite points with a straight line.

- Label intersecting points of diagonals and chords....A,B,C,D,E, and F.

- Connect the points of these pairs of letters:
  A and C, B and D, C and E, D and F, E and A, F and B

- This is a basic frame. You can experiment to discover many different geometric shapes by coloring in some of the spaces, erasing some of the lines, using different colors, or whatever creative ideas you desire.

  Part B - Students will design an emblem for their town to host the Olympics Games.

- Explain that not only do the Olympic Games have a symbol of five colorful rings, but that each city hosting the Olympic Games develops an emblem.

- Have the students connect on the Internet to Activity Sheet #16 for teachers found on the "Kids" link on the official site for the Sydney 2000 Games at this URL.

  http://www.olympics.com/eng/kids/teacher/html

- As the students look at the emblem, explain that the Sydney 2000 Games Emblem was developed to represent Sydney and the Olympic Games. The flash at the top represents the sail of the Opera House and the Olympic torch. The central figure represents an athlete in action. The three boomerangs represent the importance of Australia's indigenous culture. The writing underneath is in a relaxed style to represent the open friendly nature of Australian people.

- <u>Homework</u> - Your town has the opportunity to be selected as a host for the Olympic Games. Think about your town and its unique characteristics. Make a list of 5 things that you would like for the Olympic Committee to know about your town.

Day 5: Create and Write

- Review with students what they have learned about circles. Distribute red circles. Working in pairs, have students write what they have learned on the red circles and place them under the L on the KWL chart.

  Part A - Create an Emblem

- Share with your partner the list that you created about special things in your town.

- Introduce and analyze the directions for designing an emblem.. (<u>Student Resource #2</u>)

- Share and use the rubric on <u>Teacher Resource #3</u>.

- Create the emblem.

  Part B - Write to Persuade

- As a class, brainstorm reasons why a country might be selected by the Olympic Committee to host the Olympic Games.

- Introduce and analyze the writing prompt (<u>Student Resource #3</u>).

- Review the parts of a business letter. (<u>Student Resource #4</u>).

- Write the persuasive letter using business letter format. A scoring rubric may be found on <u>Teacher Resource #4</u>.

Performance Assessment:

Assessment will be ongoing. The tasks include scoring tools (<u>Teacher Resource #3</u> and <u>Teacher Resource #4</u>). Students will be assessed on:

- Individual and group participation
- Teacher observations
- Written work.
- Completion of assignments

Extension/Follow Up:

- Find flags from participating countries that have at least one of the Olympic Ring colors in them.
- Construct designs using a compass and a ruler.
- Identify Olympic Games that incorporate the use of circles.
- Visit the official site of the Sydney 2000 Olympic Games at this URL:
    http://www.olympics.com/eng

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Olympic Rings
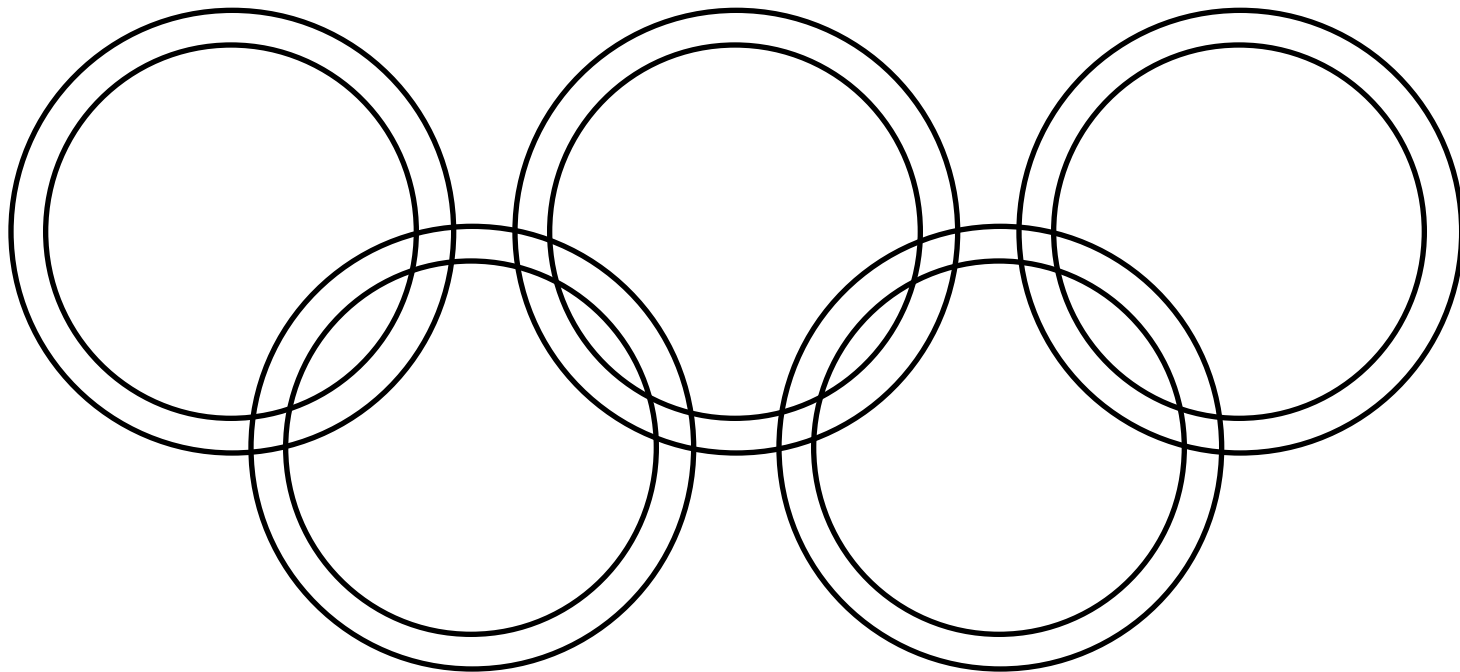
Olympic Rings Symbol

The Olympic rings as a symbol of the Olympic Games was created by Baron Pierre de Coubertin in 1913. The five rings symbolize the five continents represented in the Modern Olympic Games: Asia, Europe, Oceania, North America and South America. Every country's flag in those continents has at least one of the ring colors.

 The ring colors in order from left to right are blue, yellow, black, green, and red.

Olympic Circles
Emblem

Using the space below, draw a circle with a 3 inch radius. Then design an emblem within the circle that illustrates something special about your town. Remember to use only the colors of the Olympic rings and to include the name of your town.

Name_____ Date_____

WRITING PROMPT

Your town has decided to campaign to host the Olympic Games. Since many towns and cities are competing for this privilege, you and your classmates have been chosen to write a persuasive letter to the Olympic Committee persuading them to select your town to be a host. You also need to attach your emblem.

Remember your letter must include the elements of persuasion:

O   pinion

R   easons

E   xamples

O   pinion restated

Be sure to check for correct spelling, grammar, and punctuation.
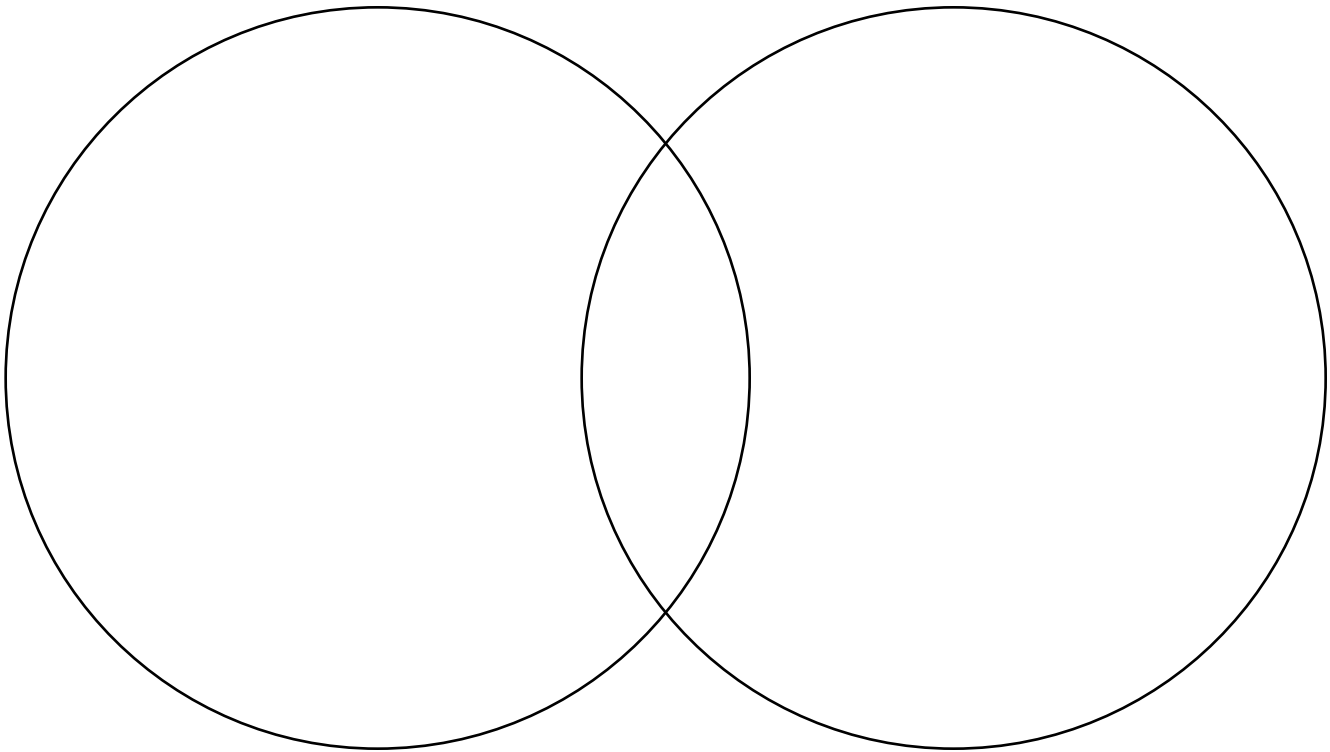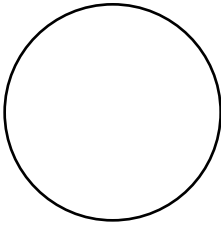
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<u>KWL Chart</u>

K	W	L
Students will place their yellow circles under the K for what they know about circles.	Students will place their blue circles under the W for what they want to learn about circles.	Students will place their red circles under the L for what they have learned about circles.

Venn Diagram for Comparing Circles and Polygons

Word Box

angles	straight	open
closed	curved	quadrilateral
lines	symmetry	
center	four-sided	

0lympic Rings Emblem

Scoring Tool

1 point for each of the following in each circle:

_____ **Circle is drawn correctly with 3 inch radius (0-3 points).**

_____ **Name of town is written correctly (0-3 points).**

_____ **Illustration representing town drawn within circle (0-3 points).**

_____ **Emblem colored with the colors of the 0lympic rings (0-3 points).**

_____ **= Total points out of 12**

Writing to Persuade
Scoring Rubric

The student:

3   includes at least three reasons and examples for their town to host the Olympics.

includes all parts of a business letter.

always uses complete sentences.

has no errors in punctuation, capitalization, and spelling.

2   includes only two reasons and examples for their town to host the Olympics.

includes only four parts of a business letter.

sometimes uses complete sentences.

has very few errors in punctuation, capitalization, and spelling.

1   includes only one reason and example for their town to host the Olympics.

includes only three parts of a business letter.

rarely uses complete sentences.

has many errors in punctuation, capitalization, and spelling.

0   has little or no response.